

Unit 4

Programs

Issues that Impact Network Performance

There are a multitude of variables that can impact the performance of a computer network. A few major factors are explored.

What is Bandwidth?

Bandwidth is a measure of exactly how much data can be transmitted across a given network at any given time. It is typically measured in Megabits per second (Mbps) or Gigabits per second (Gbps).

Megabits per second (Mbps) vs. Megabytes per second (MBps)

Before discussing bandwidth any further it is important to recognize the difference between Mbps and MBps. Megabits per second is what bandwidth is typically measured in. It is a statement of how many millions of bits (bits not bytes) can be transmitted in a single second. MegaBYTES per second is typically used to quantify file transfer speeds in storage media like hard drives. They are completely different, and the conversion is:

1 Megabyte per second = 8 megabits per second.

Internet Connection Speeds

If you've ever purchased an internet subscription, you likely were told something about the connection speed or the bandwidth of your connection. Often these advertised internet packages are labeled "15 megabit package" or "40 megabit package" There are two numbers you should be concerned with: The download speed and upload speed. If a package is advertised as "40 megabits down, 5 up" That means you will have a bandwidth of 40 Mbps when downloading or streaming anything from the internet, and a bandwidth of 5 Mbps when uploading any content to the internet.

The bandwidth of your internet connection will affect how quickly large files download from other websites. It will also affect the quality of videos that you can stream smoothly.

Example: Assume that it takes 5 Mbps of bandwidth per second. How would the following connection speeds affect your streaming experience, as well as other people using the same connection?

3 Mbps	Your streaming experience would be very poor. You would most likely notice a lot of buffering, and other peoples' internet connections would be slowed significantly.
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5 Mbps	Your streaming experience would be ok. You would most likely notice some buffering. Other peoples' internet connections would be slowed significantly.
10 Mbps	Your streaming experience would be good. You would most likely not have any buffering. Other peoples' internet connections would not be impacted significantly. Two people may be able to stream video.
20 Mbps	Three people could theoretically stream different videos and the internet connection would not seem to be impacted significantly.

Example Assume that a file server has an internet connection with “100 Megabits down and 50 Megabits up.” Also assume that you have an internet connection of “15 megabits down and 2 megabits up”.

How fast could you theoretically download a file from that server?

When downloading a file that means that the server will be using its upstream connection and you will be using your downstream connection. The server has an upsteam bandwidth of 50 Mbps, but you only have a downstream bandwidth of 15 megabits. In this case, your slower bandwidth will bottleneck the connection, and you will only be able to theoretically download at a speed of 15 Mbps.

Different Types of Networking Media

The following are different types of media that can be used to build computer networks.

Wired Networks

Wired networks were the first types of networks that emerged all the way back in the early 1970's as such, multiple types of wired media have developed over the years. Below is a table summarizing some common types of wired media and the bandwidth speeds they support.

Media	Description	Bandwidth
Twisted-pair Cables	This type of media uses four pairs of copper conductors. Each pair is twisted together.	On latest networks, 1000 Mbps is common. On older networks, 100 Mbps.
Coaxial Cables	This type of networking media is mostly obsolete. It consists of a	Up to 10 Mbps

	single copper conductor surrounded by a metallic shield.	
Fiber-optic Cables	This type of networking media uses light instead of electricity to transmit data. Although it has been around for a long time, it continues to support the fastest bandwidths.	Some standards support up to 13.271 Gbps (that is 13,271 Mbps)

Wireless Media

In the late 1990’s, wireless networks started to become commercially practical. Wireless networks use radio waves to transmit data, much like conventional radio does.

Wi-Fi

Whereas FM radio uses frequencies around 100 Megahertz (MHz). Wi-Fi, a popular wireless networking standard uses frequencies around 2.4 Gigahertz (GHz) and 5 GHz. Wi-Fi is by far the most popular wireless networking standard in modern times. It is, however, only intended for smaller networks the size of a building.

Cellular Networks

If you have a smartphone in 2018, then you almost certainly have a mobile data plan as well. Cellular networks use cellphone towers to allow phones to have an internet connection anywhere they have cell service. This type of networking media is generally much slower than Wi-Fi and typically much costlier.

Satellite Internet

If you live in a remote area, or know someone who does, there is a good chance that you are familiar with satellite internet. This type of wireless networking standard is designed to provide internet access to people living in places where running cables to them is impractical. It works in much the same way that satellite TV does—a large satellite dish transmits and receives data from satellites orbiting the earth. This type of networking standard is typically very costly and can be somewhat unreliable.